PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
B41M 3/12, B32B 27/42, 29/06, 31/12, 31/20, B44C 1/165, 5/04

A1

(11) International Publication Number: **WO 98/26936**

(43) International Publication Date: 25 June 1998 (25.06.98)

(21) International Application Number: PCT/AU97/00783

(22) International Filing Date: 18 November 1997 (18.11.97)

(30) Priority Data:
PO 4259 18 December 1996 (18.12.96) AU

(71) Applicant *(for all designated States except US)*: OM ART AUSTRALIA PTY. LTD. [AU/AU]; Lot 1, Yamba Road, Maclean, NSW 2463 (AU).

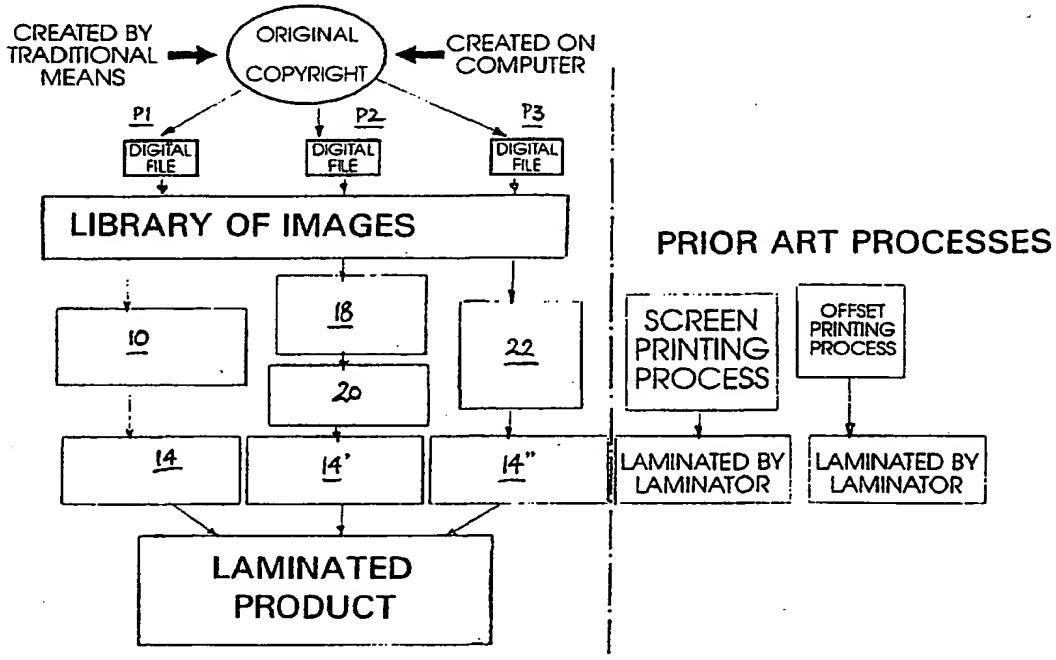
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: OXBORROW, Douglas [AU/AU]; Lot 1, Yamba Road, Maclean, NSW 2463 (AU). GIESE, John [AU/AU]; Lot 1, Yamba Road, Maclean, NSW 2463 (AU).

(74) Agent: GRIFFITH HACK; G.P.O. Box 4164, Sydney, NSW 2001 (AU).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: DIGITAL IMAGE LAMINATING



(57) Abstract

A method for transferring an image to a sheeting that is suitable for a laminating process in which the sheeting is penetrated by a laminating resin, includes the step of transferring the image in an electrostatic printing process or a laser printing process. A sheeting is also provided that is suitable for use in this method.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

DIGITAL IMAGE LAMINATING

Field of the Invention

The present invention relates to the formation of laminated products that have digital images laminated therein, and also to sheeting carrying such images. More particularly, the invention relates to digital image lamination techniques that employ thermosetting resins (eg. such as are used to produce domestic and commercial laminated surfaces). The invention also extends to sheeting that is suitable for use in related resin lamination applications, such as the production of articles in fibreglass.

Background Art

Processes employing thermosetting resins are known for the production of laminated products that have various patterns laminated therein. In general, screen printing and offset printing processes have been used to print the pattern on paper which is then laminated, typically between a kraft paper underlying support and an overlaying sheet, with the resin binding and encasing the resulting laminate. However, the quality of variety of images has been limited by restrictions on the types of print and paper that can be employed in such processes.

JP65162274 discloses a process for transferring an image via a photocopier to a sheet, which is then subsequently used in a laminating process. However, the inherent limitations with photocopiers are then embodied with the image so produced.

Summary of the Invention

The present invention in a first aspect provides a sheeting suitable for a laminating process in which the sheeting is penetrated by a laminating resin, the sheeting being suitable for having a digital image transferred thereto in an electrostatic printing or laser printing process.

Such sheeting (e.g. paper) enables a digital image to

be incorporated into the laminating process.

When the terminology "laminating resin(s)" is used herein, it is usually a reference to thermosetting resins, such as typically used in laminating processes that produce domestic and commercial surfaces (eg. for use in kitchens, furniture etc). Such resins usually include melamine formaldehyde. However, the terminology also includes coatings that are compatible with such processes (eg. coatings that have been applied to the sheeting prior to laminating (as per the second and third aspects of the invention below)).

Preferably the image is a high resolution digital image.

The terminology "high resolution" is well understood in the printing art in relation to digital images, and typically includes images of 200-400 dots per inch (dpi) quality.

Preferably the sheeting is formed from a paper adapted such that laminating resins can penetrate thereinto. Advantageously the paper is a wood-free, low-weight paper with a high calender surface, for example, a paper of less than 100 g/m^2 (eg about 70 g/m^2) in weight. Papers with weights as low as 28 g/m^2 have also been observed to be suitable. The term "low-weight" is well understood in the field of paper technology.

Preferably such a paper is also capable of receiving UV-resistant toner thereon (and is also suitable for receiving UV-resistant ink thereon, although to date no such inks have been produced to the knowledge of the applicant). A UV-resistant image has obvious outdoor use advantages, being more fade-resistant and less likely to deteriorate etc.

The invention also extends to a sheeting when carrying an image formed from UV-resistant ink or toner.

In a second aspect, the present invention relates to a method for transferring an image to a sheeting that is

suitable for a laminating process in which the sheeting is penetrated by a laminating resin, including the step of transferring the image in an electrostatic printing process or a laser printing process.

Preferably in the electrostatic printing process the image is transferred:

(i) to a transfer medium and is then transferred to sheeting that is suitable for penetration by, or that already carries, a laminating resin; or

(ii) directly to sheeting that is suitable for penetration by, or that already carries, a laminating resin.

The advantage of an electrostatic printing process is that it can be operated continuously at high speed (up to 60 inches/minute) and at high levels of image quality (eg. up to 400 dpi). It can also be conducted on wide sheeting (up to four feet wide - being the laminating industry standard). Suitable electrostatic printers that can be employed in the method of the second aspect include those manufactured by Xerox Corporation under the trade mark COLORGRAFX (such as the 8954 Series III printer).

In either step (i) or (ii), it is preferred that the laminating resin is the resin that is ultimately used in the laminating process.

In a typical mode of operation of step (i) and step (ii), the transfer medium or the sheeting is a paper or film having a dielectric coating that is suitable for receiving the image. In step (i) typically the image is subsequently transferred to the sheeting from the paper or film in a pressure transfer process.

In step (i) the image can be transferred to the sheeting in either a dry release or a wet release process. In a dry release process, transfer is typically effected under heat and pressure by passing the sheeting and the transfer medium through a pair of pinch rollers or in a vertical press. The roller temperature preferably ranges from about 80°C to 120°C and the roller pressure preferably

ranges from about 65psi to 100psi. In the vertical press, pressure is typically about 160psi and temperature is about 120°C or greater.

When a wet release process is employed, the sheeting and the transfer medium are preferably passed between a pair of pinch rollers and transfer takes place through a solvent carried by the transfer medium, using suitable solvents. Suitable solvents include melamine formaldehyde resin.

In an alternative (and advantageously simpler) mode of the image transfer, step (ii) can be conducted where the sheeting has a dielectric coating that is suitable for receiving the image, and wherein after the image has been transferred to the sheeting in the electrostatic process, the sheeting is laminated in a laminating process (ie. directly).

In this process, because the sheeting itself is electrostatically printed it can thus be directly transferred to lamination from the printing process (ie. with no intervening pressure transfer stage required).

In the laser printing process the sheeting can:

(1) be treated with a laminating resin before transferring the digital image thereto; or

(2) have the digital image transferred thereto prior to transferring the sheeting to the laminating process.

The use of a laser printer for transferring digital images has the attendant flexibility in image selection that follows from digital image storage capability.

Typically UV-resistant toners are applied directly to the sheeting.

In various methods according to the first and second aspects of the invention, the laminating resin typically is or includes melamine formaldehyde (ie. the most common resin used in industrial laminating processes). Also, the image transferred is typically a high resolution digital image, and the sheeting employed is typically sheeting as per the first aspect of the invention.

Brief Description of the Drawings

Notwithstanding any other forms which may fall within the scope of the present invention, preferred forms of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows in overview, schematic representations of preferred processes for digital image lamination according to the present invention, and also schematic representations of prior art processes;

Figure 2 shows a schematic representation of a dry thermal release/transfer process;

Figure 3 shows a schematic view of the dry thermal transfer process taking place between a pair of pinch rollers;

Figure 4 shows a schematic representation of a wet release/transfer process;

Figure 5 shows a schematic representation of part of the process of Figure 4;

Figure 6 shows a schematic representation of a direct printing process for producing a laminated product;

Figure 7 shows a schematic representation of the process of Figure 6;

Figure 8 shows a schematic plan elevation of apparatus for transferring a digital image to sheeting, employing a vertically operating press; and

Figure 9 shows in perspective view the vertically operating press of Figure 8.

Modes for Carrying Out the Invention

Referring to Figure 1, three separate processes (P1 to P3) according to the present invention are represented schematically and are compared against two prior art processes.

A first process P1 involves selecting a digital image (being an originally created image) from the library of images. A printed proof from a laser printer is prepared at stage 10. That proof is either pre-impregnated with a

laminating resin or is subsequently (in the laminating process) impregnated. The proof (usually on paper) is then laminated in a lamination process at stage 14 to produce the laminated product.

The laser printer employed is one that has been modified to cope with the typically "rougher" and lower weight sheets used in the laminating process. In this regard, to minimise abrasion of the printer rollers, different roller materials are employed (eg hard wearing ceramic materials). The lamination process is typically a thermal lamination process employing thermosetting resins and is used to produce articles (such as domestic and commercial surfaces, e.g. bench tops, furniture etc). However, suitable sheets printed in accordance with the invention can be employed in other lamination processes (eg. fibreglass lamination for furniture, signs etc).

In process P1 it is preferable to use a wood-free, low-weight paper (eg. of weight ranging from 70 to 100 grams per square metre; for example, paper of weight 70 grams per square metre will be hereinafter referred to as "70gsm paper"). Such a paper provides for good image transfer and good lamination resin penetration thereinto. It is further preferred that a paper having a high calendar surface for clear image definition thereon is employed. In this regard typically a higher weight paper (eg approaching 100gsm) is used.

In process P1, the printer can be provided with UV-resistant toner so that the products from process P1 are particularly suitable in areas of high exposure to UV radiation (e.g. direct sunlight outdoors).

With process P1 the size of paper that can be printed is only limited by the size of the printer.

In process P2, a digital image is selected from the library and is programmed into a programmable electrostatic printer. That image is then transferred in an electrostatic printing process 18 to a release paper or film

(optimally a suitable dry release or wet release paper or film), the image being a mirror image of the ultimate image to be laminated.

In stage 20, the image on the release paper or film is then transferred to a laminating resin carrying paper, preferably 70gsm paper, in a transfer process. The resulting image carrying paper is then laminated by the laminator 14' to produce the laminated product.

The applicants have also made the surprising discovery that when the paper to be laminated is precoated, prior to being passed to transfer stage 20, with a material having a greater tackiness than the release paper or film (eg. precoated with a laminating resin), then the image is preferentially lifted off the release paper and onto the precoated paper in stage 20. The paper can be and is preferably precoated with the same resin as used in the laminating stage 14' (ie. for complete compatibility and ease through the process) although ultimately the precoating only needs to be compatible with the subsequent lamination stage.

The advantage of using an electrostatic printer in process P2 is that a wide and continuous printed paper carrying a high quality digital image can be produced, and this is highly advantageous for mass produced laminated products. For example, a sheeting carrying a digital image can be prepared that is in the standard size for the laminating industry (ie 3600mm x 1200mm [ie 12ft x 4ft]). Also a wide range of paper weights can be printed (ie as low as 28gsm and up to 110-120 gsm).

In process P3, the digital image from the library is printed directly onto paper to be laminated at electrostatic printing stage 22. In this regard, a suitable paper is that produced by Sihl AG under the trade name . . . . . Such a paper minimises the negative effects of the typically employed clay compound humectant to lamination resin penetration; (humectants are typically required for papers

used in electrostatic printers - ie the humectant attracts moisture and enables a dielectric effect to be achieved on the paper when in the printer). The applicants have found that with traditional dielectric papers the humectant has prevented the subsequent permeation through the paper of a laminating resin, and hence a transfer stage has been required.

The applicants have also made the surprising discovery that when the paper to be laminated is precoated on both sides and is then provided with a dielectric coating, the paper can behave in the same way as a release paper or film in the electrostatic printing process. With a suitable coating on both sides, the paper also behaves as a humectant (retaining moisture between the coatings), thereby enabling the dielectric coating to be applied. Thus, the resulting coated paper can be polarised and accordingly directly printed with the image in the electrostatic printer. The resulting image carrying paper is then directly laminated in the laminator to produce the laminated product.

Again, the precoating on both sides may be made with the laminating resins that are ultimately used in the lamination process (stage 14") for complete process compatibility.

With the dielectric process 22 there is thus no need for transfer stage 20, with the obvious cost and time savings.

Figure 1 also shows two prior art processes, wherein images are printed onto paper which is then laminated by a laminator. However, the quality and range of images is restricted by the inherent limitations with both screen printing and offset printing, and certainly cannot match the infinite variety of possibilities with digital image laminating.

Turning now to Figures 2 and 3, the dry release transfer process P2 is explained in further detail. Referring to Figure 2, typically a graphic artist either

sketches and scans into a computer an image, or creates a digital image on computer, at stage 30 and stores that image in a digital file at 32.

The digital image is then downloaded into an electrostatic printing machine at stage 34, and the printing machine transfers toners carrying the image to a dry release film or paper at stage 36. The film or paper to which the image is printed has a dielectric coating, is thus capable of carrying a charge, and hence can be polarised (i.e. so that the toner can be transferred to the dielectric coating from the electrostatic printer). A suitable electrostatic colour printer in this regard is manufactured by Xerox Corp. under the trade name "ColorgrafX".

In stage 38, the image is transferred from the dry release paper to the paper to be laminated (e.g. 70gsm paper) by heat and pressure, to produce the printed paper at stage 40. Apparatus suitable to this purpose include laminators (having thermal pinch rollers) produced by Seal Corp. under the trade names "Seal Image 400 & 600".

In stage 14 the printed paper is laminated between five layers of kraft backing paper, an overlay paper, and a laminating resin binder to produce a custom designed laminate at stage 42.

When the paper to be laminated already carries the dielectric coating (ie. process P3) then stages 36 and 38 are eliminated.

Figure 3 shows the thermal transfer stage 38 in greater detail. Specifically, the dry release paper 44, carrying toner image 46, and the paper to be laminated 48 are passed (in the direction of arrow A) between a pair of pinch rollers 50. Typically the pinch rollers are operated and maintained at a temperature in the range of 80°C to 120°C (preferably about 100°C) and are pressed against the film/paper laminate therebetween at pressures in the range of 65psi to 100 psi (preferably around 80psi).

Because the paper 48 carries a coating that is tackier than paper 44, the toner image 46 is transferred to paper 48 as shown. The image carrying paper can then be laminated, or can be wound onto a roll and stored for subsequent lamination, with desirable lengths being cut off for laminating products (e.g. furniture, benches) etc.

Reference is now made to Figures 4 and 5, where like reference numerals have been used to denote similar or like stages. Figure 4 shows an almost identical process to that of Figure 2, but in this case a wet release transfer process is represented. Figure 5 shows more clearly how the solvent (wet) transfer process is somewhat different to the dry release process. In particular, a roller 60 carrying a pre-printed release paper or film 62 (ie that has already been printed electrostatically) is fed (unwound) in the direction of arrow B around bath roller 68. Roller 64 is partially submerged in a solvent bath 66 carrying a solvent 68 (e.g. melamine formaldehyde solvent). After passing through the bath, the film is then directed upwardly and around a guide roller 70 and then under a second guide roller 72 before being passed between thermal pinch rollers 74.

Simultaneously, a paper 76 to which the image is to be transferred (e.g. 70gsm paper) is unwound from storage roller 78, and is fed around and under the second guide roller 72 and thence between the pinch rollers 74.

The film 62 accordingly transfers the image to paper 76 whilst in between the pinch rollers via the medium of the solvent, and the image carrying paper 80 thus formed is then laminated, or stored on a roller 82 for subsequent use in lamination. The film 62 can be stored on roller 84 for subsequent use or disposal.

Referring now to Figures 6 and 7, process P1 is schematically represented. Like reference numerals have been used to denote similar or like steps.

In process P2, the digital image is sent to a laser printing machine 90 (e.g. a colour laser printer), with the

printer ideally carrying a UV stable (ie. resistant) array of toners and being supplied with lamination suitable paper (e.g. 100gsm paper). The resulting printed paper at 40' is then laminated in the conventional laminating stage 14 to produce the custom designed laminate 42. Process P1 can also be used when specific (eg. custom) sheet/paper sizes are required to be laminated.

Figure 7 shows a further schematic representation of a process P1 according to the invention. The artist creates a digital file working image at 32, and that image is processed at 100. The image is either fed to a wide format laser printer or an electrostatic printing system 90'. After suitable processing, the paper carrying the image is laminated to produce the custom designed laminate. Thus, this process can be completely automated and conducted easily and quickly.

Referring to Figure 8, a plan elevation of an automated transfer process employing a vertical press in accordance with the present invention is shown. In particular, a flat image carrying sheet 100 (as produced in the dielectric printing process) is unwound from an overhead (or under table) roll 101. The sheet 100 is cut to size and is overlayed a paper palette stack 102. The stack includes a large number of paper sheets (eg 70gsm paper suitable for use in a laminating process). One such sheet, together with the image carrying sheet are transferred (with the image sheet 100 overlaying the paper 102) to conveyor table 104 of pressing apparatus 106. The conveyor table supports a wide and continuous conveyor belt 108, which is driven by and supported on rollers 110, 112, 114 (see Figure 9). The pressing apparatus includes vertical press 116, and the conveyor belt conveys the sheet/paper combination 100/102 into the press (in the direction of arrow M).

When in the press, the sheet/paper combination is compressed between upper and lower plates (described below with reference to Figure 9) to transfer the image from sheet

100 to paper 102. Typical operating pressures are around 160psi and typical operating temperatures are 120°C or greater.

Once the image has been transferred, the sheet/paper combination is moved out of the press 116 via the conveyor belt (in the direction of arrow N, and onto a finished product palette 122 (for subsequent removal when full by a forklift FL [arrow R]).

The process is controlled by an operator O via control panel 124 (typically remotely located).

Referring to Figure 9, the vertical press apparatus 106 is described in greater detail.

As can be seen, the whole vertical press is supported on frame 126. The vertical press itself includes top beam 128, and an underlying and opposing bottom beam 130. The top and bottom beams are held apart in a fixed relationship by gap adjustment bolts 131 (but the spacing is adjustable).

Spaced from but mounted to the underside of the top beam is top press plate 132, and that plate has a plurality of heating elements 134 arranged on an upperside thereof. Typically electric or oil heating is employed to heat the top plate. Positioned on the upper side of bottom beam 130 is bottom press plate 136 separated from the top plate by a gap G prior to pressing. The bottom plate is also spaced above a press bellows assembly 138, which provides a cushioning effect to the operation of the press in use.

As can be seen, the conveyor belt 108 passes through the vertical press at gap G, between the top and bottom press plates, and conveys the sheet/paper combination to a position between the plates for pressing and image transfer.

The conveyor belt is motorised, and any one of set-up roller 110, exit roller 112 or diverter roller 114 can be driven to move the conveyor belt.

The top and/or bottom plates in the press are hydraulically activated, with an hydraulic pump 140 being driven by a motor 142, and pumping hydraulic oil from

reservoir 144, typically to a circuit that drives the top plate 132 towards the bottom plate 136 (ie via line 146 [Figure 8]). After pressing, the oil returns to the reservoir via return line filter 148 (Figure 8).

In use, a predetermined length of image carrying sheet is unwound from image roll 101, and is cut to an appropriate size. A sheet of paper 102 is removed from the palette stack, and both are positioned by an operator on the conveyor belt by moving the same in the direction of arrows P. The conveyor belt is then activated at the control panel, to move the sheet/paper combination in between the top and bottom plate of the vertical press. Typically, the control panel is remotely located from the pressing apparatus for reasons of safety. When appropriately positioned, the conveyor belt is shut off, and then the pressing apparatus is activated. The pressing apparatus is already at the desirable temperature (typically 120°C or greater). By employing a hydraulic circuit, high pressures (160psi) can be imparted to the sheet/paper combination by driving the top plate into the lower plate. The press bellows assembly 138 absorbs the impact of the high pressure.

Typically the top press plate is held against the bottom press plate for around 6 to 30 seconds, depending on the ink, images and paper being pressed. The press transfer time can be regulated by the operator.

Once the image has been transferred to the paper 102, the press is released, the conveyor is activated and the combination is then transferred out of the press and onto finished product palette 122.

Using such an apparatus, a large number of image transfers can be conducted quickly, because of the high pressures and automation (and therefore rapid transfer time).

Whilst the invention has been described with reference to a number of preferred embodiments, it should be

appreciated that the invention can be embodied in many other forms.

CLAIMS:

1. A sheeting suitable for a laminating process in which the sheeting is penetrated by a laminating resin, the sheeting being suitable for having a digital image transferred thereto in an electrostatic printing or laser printing process.

2. A sheeting as claimed in claim 1 wherein the image is a high resolution digital image.

3. A sheeting as claimed in claim 1 or claim 2 that is a wood-free, low-weight paper.

4. A sheeting as claimed in claim 3 wherein the paper has a weight of less than about 100 g/m^2.

5. A sheeting as claimed in claim 4 wherein the paper has a weight of about 70 g/m^2.

6. A sheeting as claimed in any one of the preceding claims that is capable of receiving UV-resistant ink or toner thereon.

7. A sheeting as claimed in any one of claims 1 to 5 when carrying an image formed from UV-resistant ink or toner.

8. A sheeting as claimed in any one of the preceding claims that is suitable for being penetrated by a melamine formaldehyde resin.

9. A method for transferring an image to a sheeting that is suitable for a laminating process in which the sheeting is penetrated by a laminating resin, including the step of transferring the image in an electrostatic printing process or a laser printing process.

10. A method as claimed in claim 9 wherein, in the electrostatic printing process, the image is transferred:

(i) to a transfer medium and is then transferred to sheeting that is suitable for penetration by, or that already carries, a laminating resin; or

(ii) directly to sheeting that is suitable for penetration by, or that already carries, a laminating resin.

11. A method as claimed in claim 10 wherein the

transfer medium of step (i) and the sheeting of step (ii) is a paper or film having a dielectric coating that is suitable for receiving the image in an electrostatic printer.

12. A method as claimed in claim 10 or claim 11 wherein in step (i) the image is subsequently transferred to the sheeting from the paper or film in a pressure transfer process.

13. A method as claimed in claim 12 wherein the image is transferred to the sheeting in either

(a) a dry release process; or

(b) a wet release process.

14. A method as claimed in claim 13 wherein in step (a) the pressure transfer process takes place either in a pinch roller press arrangement or in a vertical action press, at a temperature greater than ambient.

15. A method as claimed in claim 14 wherein for pinch roller pressing the temperature is in the range of 80°C to 120°C and the pressure ranges from 65psi to 100psi, and for the vertical press the temperature is greater than 120°C and the pressure is about 160 psi.

16. A method as claimed in claim 11 wherein in step (b) the sheeting and the transfer medium are passed between a pair of pinch rollers and transfer takes place through a solvent that is carried by the transfer medium.

17. A method as claimed in claim 16 wherein the solvent includes a melamine formaldehyde resin.

18. A method as claimed in claim 9 wherein, in the laser printing process, the sheeting has:

(1) been treated with the laminating resin prior to having the digital image transferred thereto; or

(2) the digital image transferred thereto prior to being transferred to the laminating process.

19. A method as claimed in claim 18 wherein a laser printer applies a UV-resistant toner to the sheeting.

20. A method as claimed in any one of claims 10 to 19

wherein after the image has been transferred to the sheeting, the sheeting is laminated in a laminating process.

21. A method as claimed in any one of claims 10 to 20 wherein, when the laminating resin is applied to the sheeting prior to printing thereon or transfer thereto, the resin used is the same resin as used in the laminating process.

22. A method as claimed in claim 21 wherein the resin is or includes melamine formaldehyde resin.

23. A method as claimed in any one of claims 9 to 22 wherein the image is a high resolution digital image.

24. A method as claimed in any one of claims 9 to 23 wherein the sheeting is as defined in any one of claims 1 to 8.

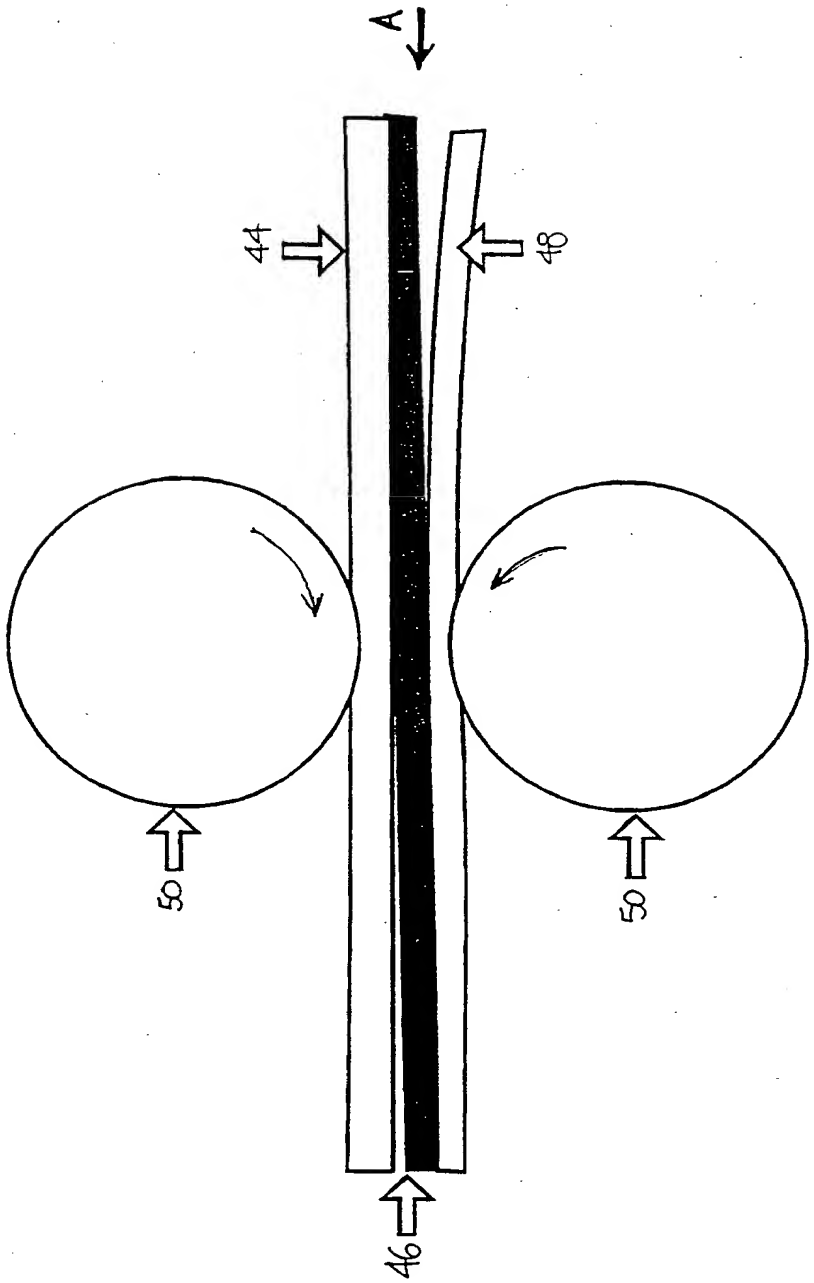


Figure 3

Figure 4

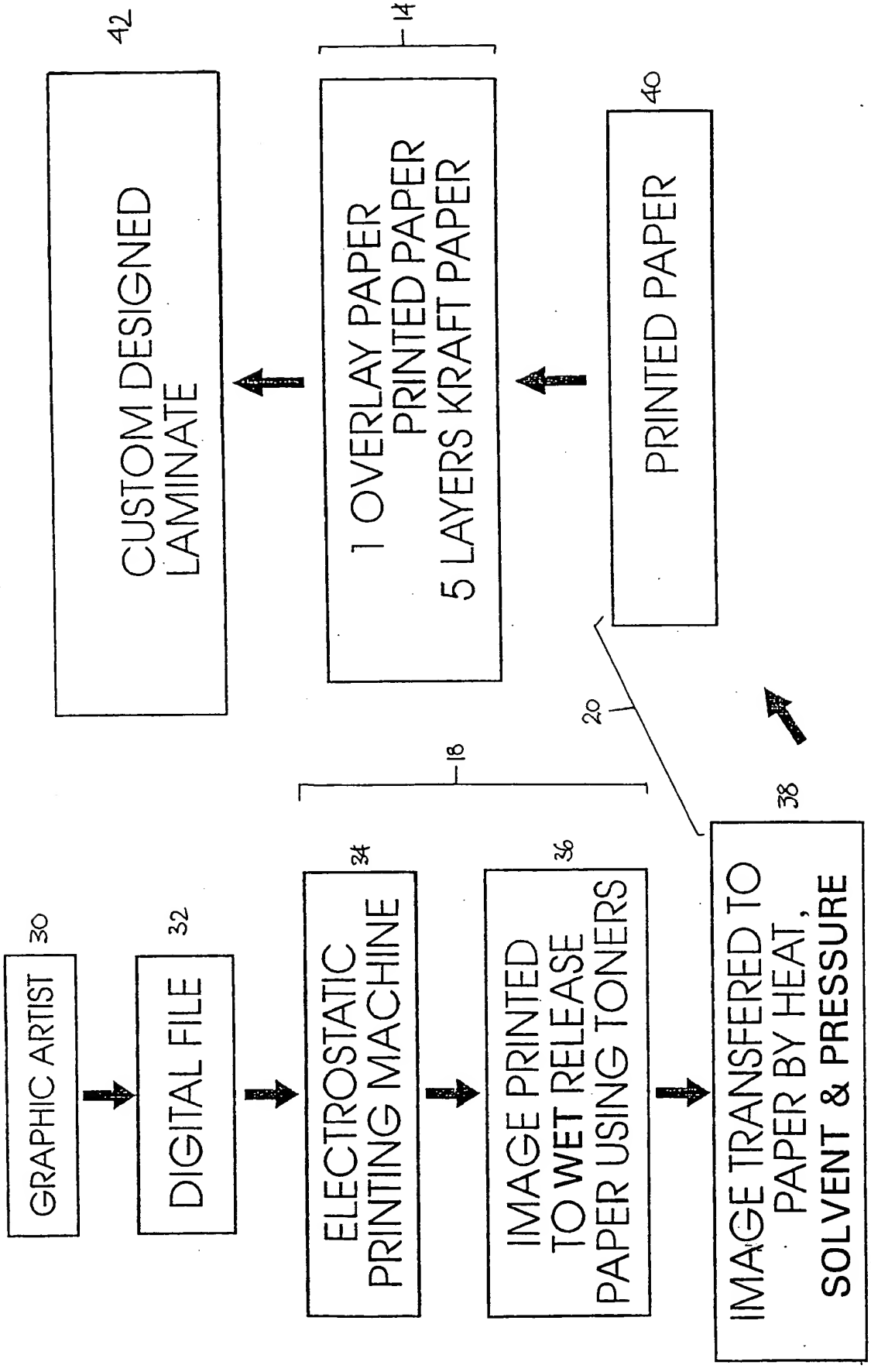


FIGURE 5

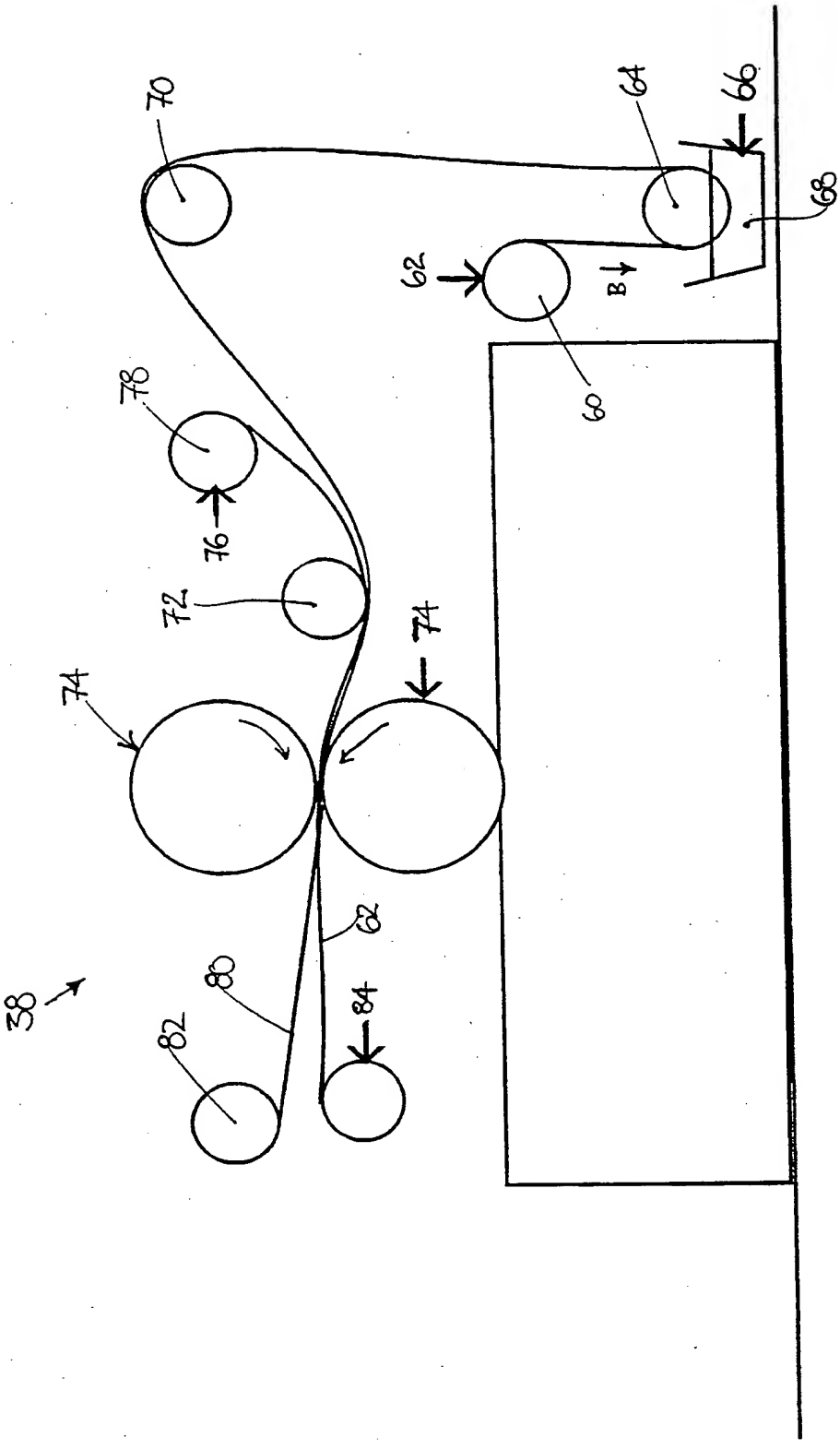
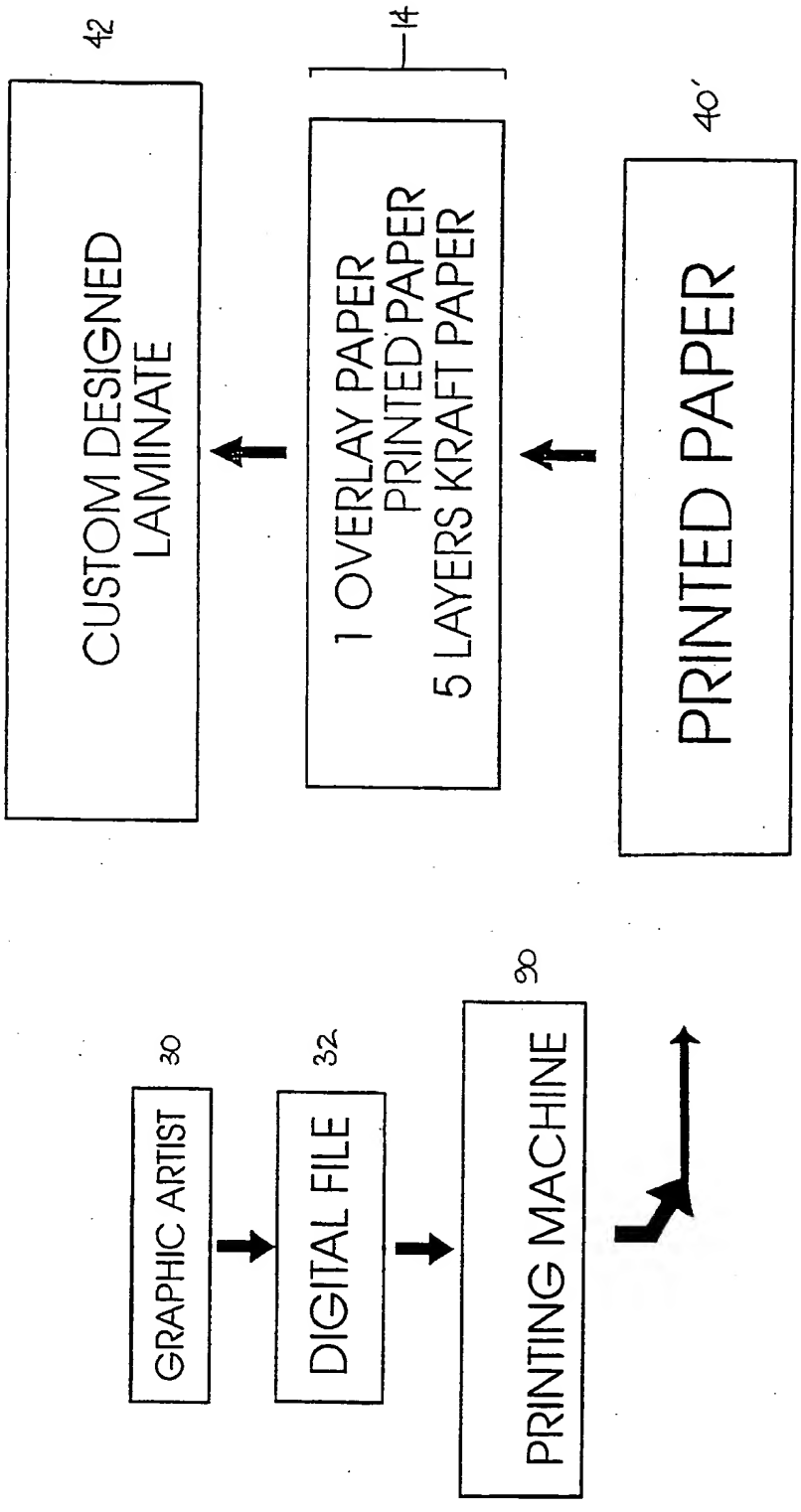


Figure 6



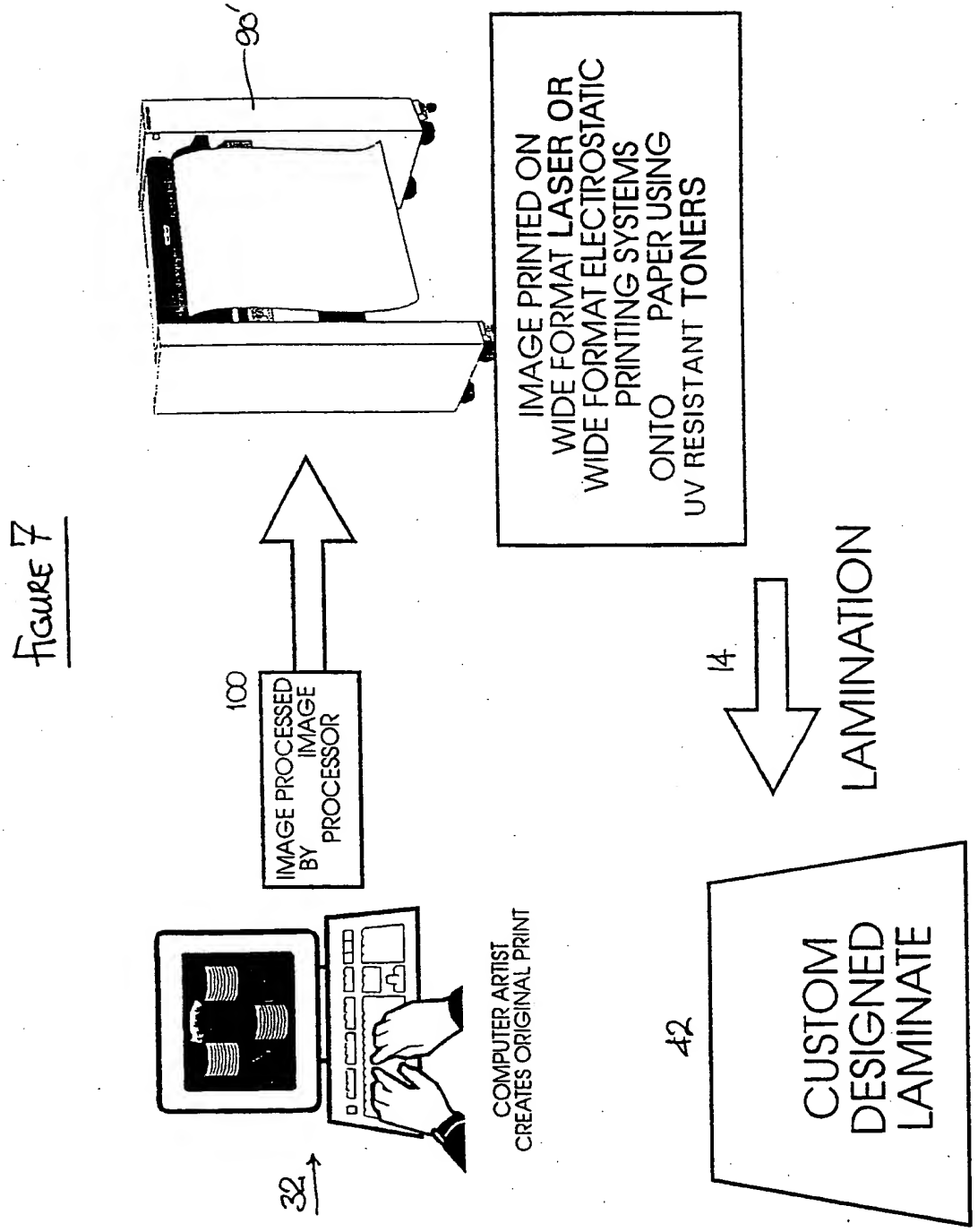


FIGURE 7
90'
IMAGE PRINTED ON WIDE FORMAT LASER OR WIDE FORMAT ELECTROSTATIC PRINTING SYSTEMS ONTO PAPER USING UV RESISTANT TONERS
100
IMAGE PROCESSED BY IMAGE PROCESSOR
14
LAMINATION
32
COMPUTER ARTIST CREATES ORIGINAL PRINT
42
CUSTOM DESIGNED LAMINATE

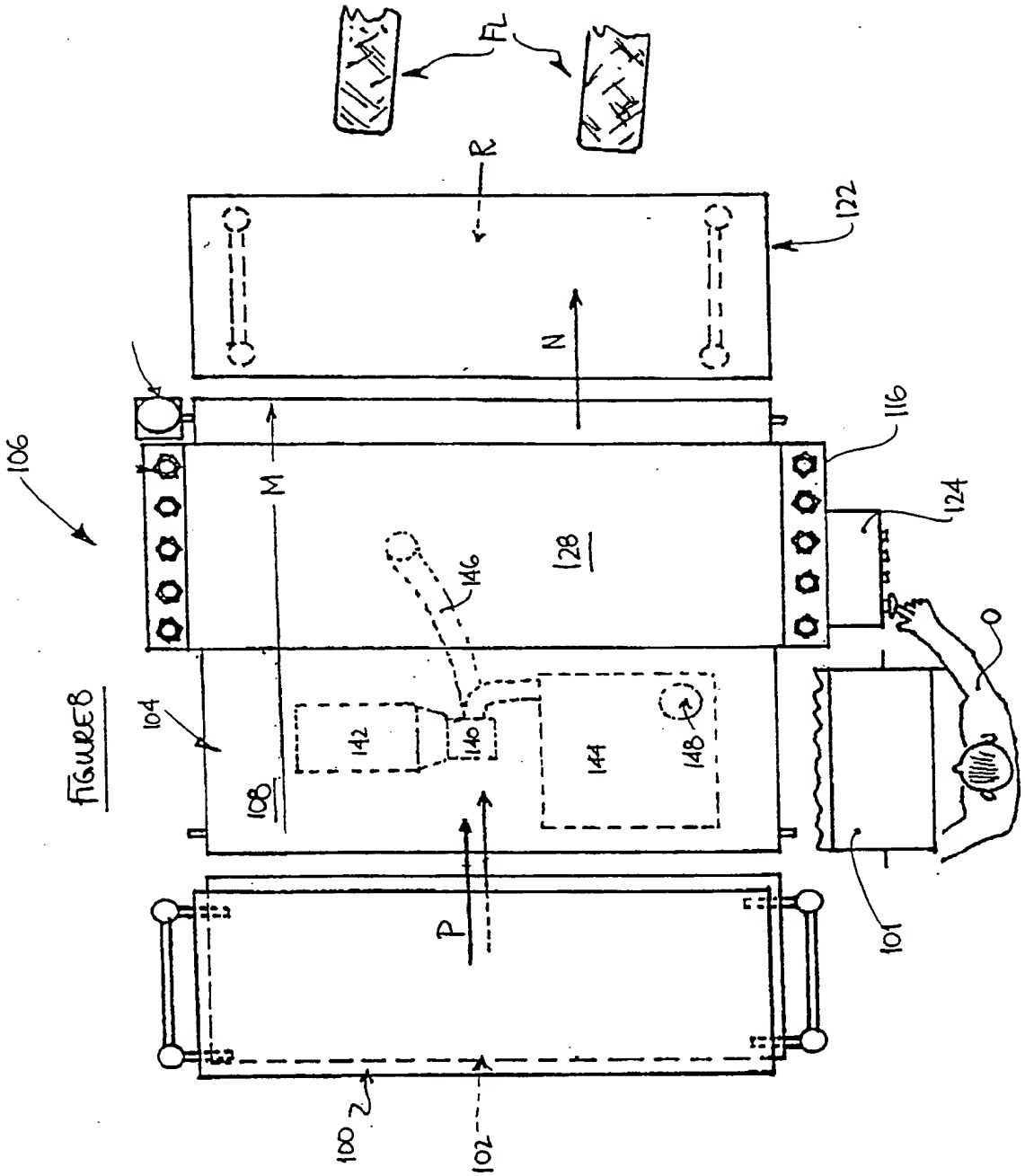

FL
R
122
N
116
106
M
124
146
128
O
104
142
140
144
148
108
P
101
100
102

FIGURE 8

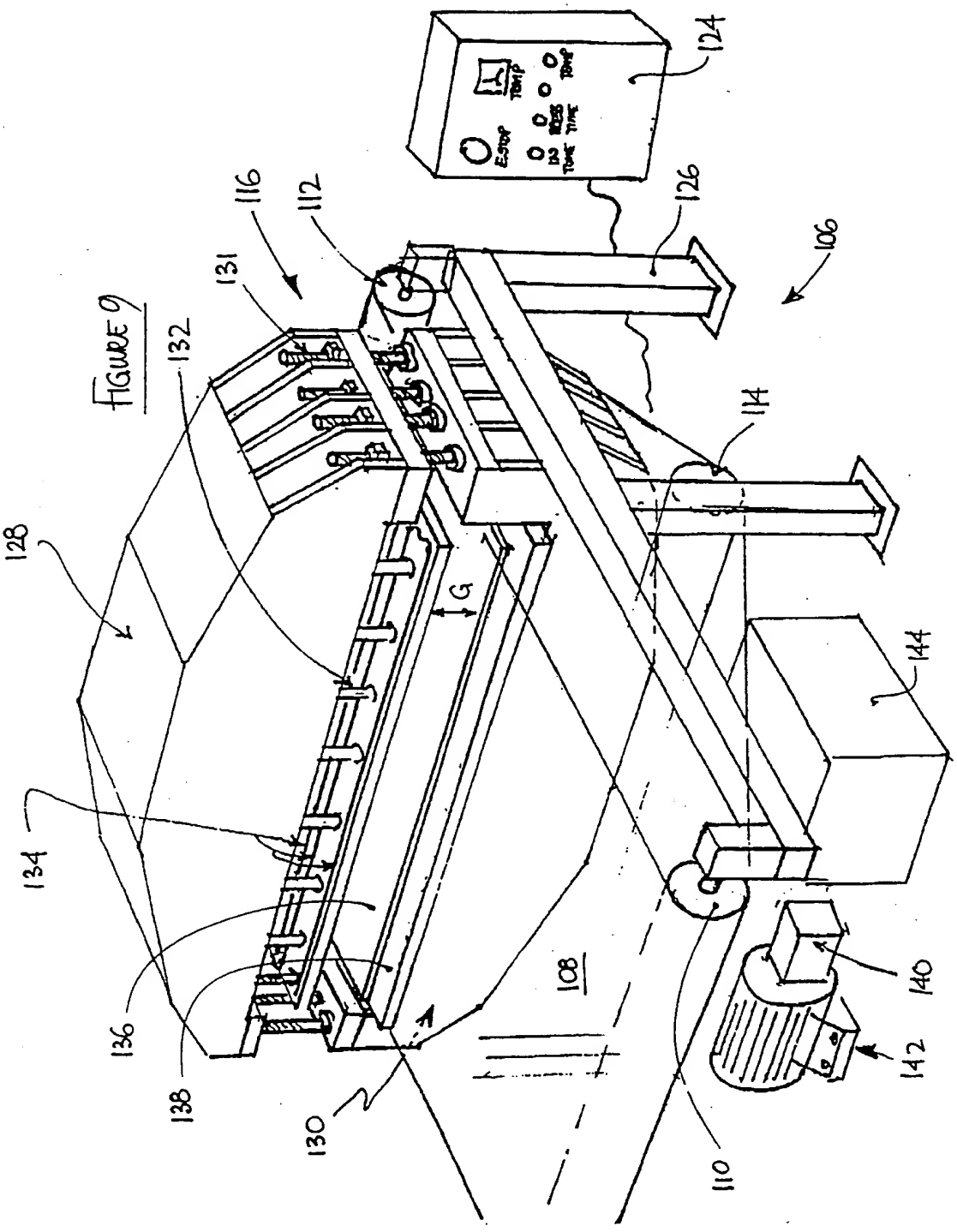

124
126
106
116
112
131
132
114
128
G
144
134
108
140
136
142
138
130
110

FIGURE 9

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00783

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: B41M 3/12, B32B 27/42 29/06 31/12 31/20, B44C 1/165 5/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT: (SHEET: OR PAPER# OR WEB) AND (THERMOSET: OR THERMO()SET: OR MELAMINE OR DIELECTRIC:) AND (RESIN# OR COAT:) AND LAMINAT: AND TRANSFER: AND (IMAG: OR PICTUR: OR DESIGN# OR PRINT:)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3373068 A (GROSHEIM et al.) 12 March 1968 col 2 line 28- col 3 line 3, Figures	1-24
X	US 3814647 A (SCHER et al.) 4 June 1974 col 3 lines 36-72, Figures	1-24
X	EP 327095 A (TOPPAN PRINTING CO., LTD) 9 August 1989 col 6 line 4- col 8 line 43, Figures	1-24

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 December 1997	19 JAN 1998
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer **GREG POWELL** Telephone No.: (02) 6283 2308

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00783

C (Continuation) **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 3724719 A (NORTECH CHEMIE GmbH & Co. KG) 2 February 1989 Abstract	1-24
X	Patent Abstracts of Japan, M-983, page 7, JP 2-78548 A (DAINIPPON PRINTING CO. LTD.) 19 March 1990 Abstract	1-24
X	Derwent Abstract Accession No. 92-128437/16, Class P73, JP 4-71843 A (NAGASE SANGYO KK) 6 March 1992 Abstract	1-24
X	Derwent Abstract Accession No. 93-239637/30, Class S06, JP 5-162274 A (SUMITOMO BAKELITE CO.) 29 June 1993 Abstract	1-24

INTERNATIONAL SEARCH REPORT
Information on patent family members

International Application No.
PCT/AU 97/00783

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
EP	327095	US	4971854	JP	1297176

END OF ANNEX